



Entergy Nuclear Operations, Inc.  
Pilgrim Nuclear Power Station  
600 Rocky Hill Road  
Plymouth, MA 02360

July 29, 2003

Michael A. Balduzzi  
Sra Vice President

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555

Subject                      Entergy Nuclear Operations, Inc.  
Pilgrim Nuclear Power Station  
Docket No. 50-293 License No. DPR-35

Licensee Event Report 2003-003-00

Letter Number:        2.03.089

Dear Sir:

The enclosed Licensee Event Report (LER) 2003-003-00, "Automatic Scram Resulting from Load Rejection at Full Power due to Transformer Fault," is submitted in accordance with 10 CFR 50.73

This letter contains no commitments.

Please feel free to contact me if there are any questions regarding this subject.

Sincerely,

A handwritten signature in cursive script that reads "Michael A. Balduzzi".

Michael A. Balduzzi

DWE/dd

cc:    Mr. Hubert J. Miller  
Regional Administrator, Region 1  
U.S. Nuclear Regulatory Commission  
475 Allendale Road  
King of Prussia, PA 19406

Senior NRC Resident Inspector

Mr. Travis Tate  
Project Manager  
Office of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
1 White Flint North Mail Stop: 0-8B-1  
11555 Rockville Pike  
Rockville, MD 20555-001

INPO Records

A handwritten signature in cursive script, possibly reading "J. E. 22".

**LICENSEE EVENT REPORT (LER)**(See reverse for number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

**FACILITY NAME (1)**  
**PILGRIM NUCLEAR POWER STATION**
**DOCKET NUMBER (2)**  
**05000-293**
**PAGE(3)**  
**1 of 6**
**TITLE (4)**  
**Automatic Scram Resulting from Load Rejection at Full Power due to Transformer Fault**

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
06	01	2003	2003	003	00	07	29	2003	N/A	05000
									N/A	05000

  

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11)			
POWER LEVEL (10)	100	20.2201(b)	22.2203(a)(3)(i)	50.73(a)(2)(i)(C)	50.73(a)(2)(v5)
		22.2202(d)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(A)	50.73(a)(2)(vii)(A)
		20.2203(a)(1)	20.2203(a)(4)	50.73(a)(2)(ii)(B)	50.73(a)(2)(vii)(B)
		20.2203(a)(2)(i)	50.36(3)(1)(i)(A)	50.73(a)(2)(iii)	50.73(a)(2)(ix)(A)
		20.2203(a)(2)(ii)	50.36(3)(1)(ii)(A)	X 50.73(a)(2)(iv)(A)	50.73(a)(2)(x)
		20.2203(a)(2)(iii)	50.36(c)(2)	50.73(a)(2)(v)(A)	73.71(a)(4)
		20.2203(a)(2)(iv)	50.46(a)(3)(ii)	50.73(a)(2)(v)(B)	73.71(a)(5)
		20.2203(a)(2)(v)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(C)	OTHER Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(vi)	50.73(a)(2)(i)(B)	50.73(a)(2)(v)(D)			

**LICENSEE CONTACT FOR THIS LER (12)**
**NAME**  
 Bryan Ford - Licensing Manager

**TELEPHONE NUMBER (include Area Code)**  
 508-830-8403
**COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	EA	XMFR	W120	Y					

**SUPPLEMENTAL REPORT EXPECTED (14)**

YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO	EXPECTED SUBMISSION DATE(15)	MONTH	DAY	YEAR

**ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)**

On June 1, 2003 an unplanned automatic scram occurred while at 100% reactor power. The scram was the result of a load rejection. Automatic responses included the insertion of all withdrawn control rods, transfer of the source of electrical power for Pilgrim's 4.16 kV auxiliary power distribution system (APDS), closure of the turbine steam control and stop valves, trip of the turbine, opening of the turbine steam bypass valves, and opening of main steam relief valves for pressure relief.

The direct cause of the scram was the automatic closing of the turbine control valves. The direct cause of the event was an electrical fault in the unit auxiliary transformer (UAT) that was powering the APDS at the time of the event. The fault was the result of the failure of a conductor within the low voltage portion of the UAT (X-winding).

Corrective actions taken included a temporary alteration for powering the APDS during power operation. Corrective actions planned include the repair or replacement of the unit auxiliary transformer.

The event posed no threat to public health and safety.

# **LICENSEE EVENT REPORT (LER)** **TEXT CONTINUATION**

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

## **BACKGROUND**

The preferred offsite power source for Pilgrim Station is the 345 kV transmission lines 342 and/or 355 via the Startup Transformer. The secondary offsite power source is the 23 kV distribution system via the Shutdown Transformer.

During power operation when the Main Transformer is energized by the Main Generator, the Pilgrim Station 4.16 kV auxiliary power distribution system (APDS) is normally powered from the Unit Auxiliary Transformer.

The APDS provides power to nonsafety-related and safety related loads. The nonsafety-related electrical loads are powered from 4.16 kV Buses A1 through A4 and the respective 480 volt load centers and motor control centers. The safety-related electrical loads are powered from 4.16 kV Buses A5 and/or A6 and the respective 480 volt load centers and motor control centers.

During plant shut down conditions when the 345 kV transmission lines are energized, the APDS is powered from the 345 kV transmission system by the Startup Transformer via the respective 345 kV switchyard circuit breakers. During plant shut down conditions when the 345 kV lines are not energized, the safety-related 4.16 kV Buses (A5/A6), and respective load centers and motor control centers, are designed to be powered by the respective emergency diesel generator (EDG 'A'/EDG 'B') or the 23 kV distribution system via the Shutdown Transformer (Buses A5 and/or A6) or the Station Blackout Diesel Generator (Bus A5 or Bus A6).

Just prior to the event the following conditions existed. The preferred and secondary offsite power sources were energized, the switchyard ringbus was intact, the EDGs and the Station Blackout Diesel Generator were in standby service. The Main Transformer was energized by the Main Generator with the APDS being powered from the Main Transformer via the Unit Auxiliary Transformer (UAT). The reactor was operating at 100% power (1998 MWt) with the reactor mode selector switch in the RUN position. The reactor vessel pressure was normal, about 1035 psig, with the reactor water at the saturation temperature for that pressure. The reactor water level was normal, at about +26" (narrow range).

## **EVENT DESCRIPTION**

On June 1, 2003 at about 0850 hours, an unplanned automatic reactor protection system scram signal and scram occurred while at 100% reactor power (1998 MWt). The scram signal resulted in the automatic insertion of the control rods that were in a withdrawn position at the time of the event. The reactor core display panel and the plant computer (EPIC) call-rods function indicated all control rods were fully inserted.

The scram signal was initiated by the closing of the turbine steam control valves. The closing of the turbine steam stop valves also resulted in an automatic scram signal.

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The event was initiated by a trip of the unit auxiliary transformer (UAT) differential relay that resulted in a trip of the main generator lockout relay. The trip of the lockout relay included the automatic transfer of the source of 4.16 kV power for the APDS from the UAT to the Startup Transformer, automatic opening of the 345 kV switchyard circuit breakers that connect the main transformer to the switchyard, automatic opening of the main generator field breaker, and automatic trip of the master trip solenoid (MTS-1) that is part of the turbine mechanical-hydraulic control system.

The trip of MTS-1 included the automatic closing of the turbine steam control valves and stop valves. Collectively, the three turbine steam bypass valves have a capacity for diverting 25% of the rated main steam flow to the main condenser. The steam flow from the reactor vessel exceeded the capacity of the bypass valves and the consequence was the expected, relatively rapid increase in the reactor vessel/main steam pressure.

The reactor vessel pressure increase and insertion of the control rods each contributed to a decrease in the reactor water void fraction (shrink). The decrease in the void fraction resulted in a decrease in the reactor water level. The reactor water level decreased to about -10" (narrow range). The decrease in reactor water level, to less than the low water level setting of about +12" (narrow range), resulted in the expected automatic actuation of the Primary Containment Isolation Control System [(PCIS Groups 2 (Sampling System) and 6 (Reactor Water Cleanup System))] and Reactor Building Isolation Control System (RBIS).

Meanwhile, the pressure increase resulting from the closing of the turbine steam valves (control valves and stop valves) resulted in the automatic opening of three of the four main steam relief valves for the pressure relief function. Post trip review verified each relief valve that actuated demonstrated a normal opening and reseal within the valves' specification and that the response of all four relief valves was in accordance with design.

After the main steam relief valves closed, the turbine steam bypass valves provided the reactor/main steam pressure control function.

The operation of the bypass valves resulted in a gradual decrease in the reactor vessel pressure and consequent increase in the reactor water void fraction (swell). The maximum reactor water level that occurred was about +52". The high pressure coolant injection (HPCI) system turbine control system received a trip signal as a result of the high water level condition. The HPCI high water level trip function is nonsafety-related, functions to protect the HPCI turbine from water, and can be manually reset when the reactor water level is less than the trip setting or is automatically reset if a reactor water low-low level condition occurs.

The high water level condition also resulted in an automatic close signal to the normally closed reactor core isolation cooling (RCIC) system turbine steam supply valve. The high water level closing function for the valve is nonsafety-related, functions to protect the RCIC turbine from water. The valve can be manually opened when the reactor water level is less than the high water level setting or is automatically opened if a reactor water low-low level condition occurs. The RCIC turbine steam supply valve remained closed as designed.



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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

Control room licensed operator response to the event included the following. The full insertion of the control rods was verified. The PCIS and RBIS actuations were verified. A reactor water level band of 20" to 40" was established by 0900 hours.

The HPCI turbine high water level trip was manually reset at 1040 hours.

The NRC Operations Center was notified of the event in accordance with 10 CFR 50.72 at 1100 hours on June 1, 2003.

## **CAUSE**

The direct cause of the scram was the automatic closing of the turbine control valves. The closing of the turbine control valves (and stop valves) was the result of the automatic actuation of the turbine master trip solenoid (MTS-1). The trip of MTS-1 was the result of the automatic trip of the generator lockout relay. The trip of the lockout relay was the result of the automatic trip of the UAT differential relay. The trip of the differential relay was the result of an electrical fault in the UAT.

The direct cause of the event was the failure of the conductor that connects to the phase 'A' of the UAT (X-winding). The failure was internal to the transformer. The UAT phase 'A' winding powers the phase 'A' portion of Pilgrim's 4.16 kV APDS. The UAT was installed during original plant construction (c. 1970). The UAT is a three phase, oil-cooled, 60 Hz, type SL power transformer manufactured by the Westinghouse Electric Corporation. The nameplate data is as follows: Serial Number RCR-23161, Class OA/FA/FDA, Insuldur Insulation, L. Spec. 874190, (primary) 23000 volts Delta winding (H winding), (secondary) 4160/2400 volts Wye winding (X-winding, Y-winding), 5-position load tap changer. Tap number 4 was the working tap position at the time of the fault.

## **CORRECTIVE ACTION**

Corrective actions taken included the following:

- The Pilgrim Station electrical system was aligned such that the APDS is powered from the Startup Transformer during power operation, pending repair or replacement of the Unit Auxiliary Transformer.
- The Unit Auxiliary Transformer was disconnected and shipped offsite for evaluation and repair or replacement.

Corrective actions planned include the following:

- Repair or replacement of the Unit Auxiliary Transformer.
- Review of a vendor evaluation to establish additional actions necessary for early detection to eliminate the potential of a future failure of the UAT.

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## **SAFETY CONSEQUENCES**

The event posed no threat to public health and safety.

The maximum reactor power experienced during the event was about 101% and decayed as expected.

The plant systems responded as designed to the transient. The preferred and secondary sources of offsite power remained energized. The EDGs and Station Blackout Diesel Generator remained available during the event. The Core Standby Cooling Systems (HPCI System, Automatic Depressurization System, Residual Heat Removal System, Core Spray System) and the RCIC System remained available during the event to provide makeup water or core cooling if necessary.

The maximum reactor pressure that occurred was less than the Technical Specification limit including tolerance for the relief valves and safety valves. The response of the main steam relief valves was in accordance with design. The opening of one or more relief valves is an expected occurrence resulting from a load rejection at 100% power.

The minimum reactor water level that occurred was about -10" (narrow range). The level was above the low-low water level (about -46") for automatic actuation of the Core Standby Cooling Systems and automatic actuation of the Group I portion of the PCIS. The level was also above the level (about -127") corresponding to the top of the active fuel zone.

## **REPORTABILITY**

This report was submitted in accordance with 10 CFR 50.73(a)(2)(iv) because the actuation of the RPS was not planned.

## **SIMILARITY TO PREVIOUS EVENTS**

A review was conducted of Pilgrim Station Licensee Event Reports (LERs) submitted since 1984. The review identified previous scrams resulting from load rejections but identified no previous events that were caused by the Unit Auxiliary Transformer. The review identified two similar LERs. LER 89-010-00 reported a failure (fault) of one of the feeder cables that connect the Startup Transformer to the APDS; the failure occurred while shut down when the SUT was powering the APDS and was caused by cable jacket damage during original construction installation (c. 1970). LER 97-004-01 reported a failure (fault) of the Main Transformer that occurred while the transformer was powering the APDS, in a backfeed configuration, while shut down; the failure was caused by a degraded transformer winding condition or static electrification.

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**ENERGY INDUSTRY IDENTIFICATION SYSTEM (EII) CODES**

The EII codes for the report are as follows:

COMPONENTS	CODES
Circuit Breaker, AC	52
Relay, Differential, Protective	87
Relay, Locking-Out	86
Solenoid (MTS-1)	SOL
Transformer (UAT)	XMFR
Valve (Control, Stop, Bypass)	V
Valve, Relief (RV-203-3A/B/C/D)	RV

**SYSTEMS**

Engineered Safety Features Actuation (RPS, PCIS, RBIS)	EA
High Pressure Coolant Injection	BJ
Main Generator Output	EL
Main Steam	SB
Medium Voltage Power	EA
Switchyard	FK
Turbine Steam Bypass Control	JI